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Scaling Up the Evidence: Sustainable Models for eHomeCare

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Abstract: The introduction of smart ICT and Future Internet services can contribute to a more sustainable and qualitative life for elderly people living at home. This involves a lot of actors in a complex eco-system, all with their own expectations and outlook for potential benefit, either in business or social benefit, but also the bottlenecks and possible pitfalls need to be considered. We will show in this paper the introduction of the Xtramira platform, a video communication platform using the TV set as interface screen, equipped with personal alarm system and telemetry functionality, their concept and product development, business model and how the product has been introduced in the market, why it was not successful, the lessons learned and the next steps.

1 Introduction

The increasing elderly population in most Western European countries will lead to many challenges in the upcoming years. Providing good quality care, to more elderly people, with a lower availability of professional care providers and within a stringent health care budget calls for innovative solutions. Keeping elderly people longer at home can resolve partly the waiting list problem for retirement homes, but cost-efficient and quality care solutions at home should be available. Based on a study of Itinera [1], every week one new retirement home should be built in Flanders to keep up with the demand. This is not a sustainable solution, either in the short or long term. ICT can stimulate smart product and service concepts in the setting of the patient's home to reduce social inclusion (e.g. video communication) and better follow up of (medical) conditions of the patient (e.g. telemetry, fall detection, patient movement). The introduction of these services will also affect the operational care processes in a positive manner (more efficient patient visits, improved communication, decrease of work pressure, etc.).

We will show in this paper the introduction of the Xtramira platform [2], a (family) video communication platform using the TV set as interface screen, equipped with personal alarm system and telemetry functionality. For several years many initiatives have been taken to explore the technical and social implications when offering eCare services. Examples of research projects in this area include IST @Home and Topcare, and IBBT TranseCare and e-HIP. In [3] a review of digital interactive television systems and their applications in health and social care was performed. Of the 25 systems found (only seven

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were commercial) focusing on vital sign monitoring (68%) and health information (56%), making use of two-way communication (88%), medical peripherals (68%) and video communication (36%). Several companies or consortia have started commercial services but large-scale rollouts have been lacking due to the absence of convincing business models. Commercial products from e.g. Zydacron, Philips, Tunstall, Fifthplay, CardGuard and Intel are available, but do not offer all functionalities as the Xtramira platform. The regulatory framework is most of the time not adapted for offering new ICT based care services leading to postponement of the introduction of these innovative services.

The next section explains our techno-economic value network evaluation tool, which is then used for evaluating the Xtramira case. Section 3 and 4 show the concept and product development, business model and market launch of the Xtramira case, indicating why it was not successful, the lessons learned and the next steps. We will thus show a post analysis of the introduction of an innovative eHealth product introduced and the lessons learned from this case. Finally some conclusions are drawn.

2 Techno-Economic Value Network Evaluation Tool

Within the IBBT TranseCare project [4] a generic techno-economic value network evaluation model has been elaborated, able to calculate and analyse the (socio-)economic viability of innovative care services. We describe first a generic value network with roles, upon which actors can be mapped, and thus different business models can be defined. A multi-actor analysis indicates then the benefits for all actors involved in this ecosystem when offering these services. We can demonstrate that every actor involved in the care process, ranging from patient to technology suppliers over primary and home care to governmental instances, benefits from ICT innovation in home care services [5].

2.1 Roles Required for Offering eCare Services

Three different streams can be defined when offering eCare services: the development and delivery of the eCare platform, providing health care services and ensuring the financial viability of the ecosystem.

The development of an eCare service requires a number of required steps. Depending on the type of service, new *hardware* needs to be created and/or has to be acquired (off the shelf equipment e.g. for telemetry meters, alarm buttons) or current operational devices (e.g. Internet gateway, IPTV box, mobile handset) can be used. Next to the hardware, *software* needs to be written and tested. Both hardware and software, either developed or purchased, will represent a large overall (upfront) cost. Next to these capital expenditures (CapEx), operational expenditures (OpEx) such as installation, maintenance and repair, support, etc. have to be considered. Offering added value features such as video communication or telemetry measurement will require additional roles such as a (permanently staffed) *call center,* taking care of emergency and helpdesk telephone/video calls, or *data center*, which will handle storage and security of the patient's health record data. The final role is the *distribution* of the service and/or platform with additional processes such as delivery, marketing, sales and billing. Finally when interactive services are offered *network connectivity*, either fixed line (telephony, Internet) or mobile connection will be required.

The introduction of innovative eCare services will also have its influence on the current operational processes within the *health care provisioning*. Processes within care organisations will have to be altered in order to have maximal (cost/time efficient) effect of the new innovations e.g. less / more time efficient patient visits for home care organisations when video communication could be set up or telemetry data will be available, eConsultations by doctors through video communication, etc.

The third stream comprises the financial roles. At this moment, due to large investments and shortage of budget within the care organisations, the most important role is *subsidization and reimbursements* for eCare solutions. Health *insurance* budget can also be allocated for investments in eCare solutions, in order to offer a better service towards its customers. Finally as with most services within the health care sector, a *private* part needs to be contributed by the patient. The main issues concerning the migration towards eCare services for patients relate to the trade-off between their own financial contributions versus improved/additional health care they receive.

2.2 Actors Involved and Their Potential Benefits

It is of utmost importance to indicate for each actor involved in offering of eCare services, whether they are patient, involved in service delivery or care processes, or taking care of the organisational and financial organisation their potential benefits, either in business opportunities or in view of social benefit. This will differ depending on the type of actor.

The *developers of hardware and software* can take up a first mover advantage when commercialising products for the eHealth market. This market is not cultivated and has a high growth potential. *Telecom operators* can focus on a niche market segment currently underserved. *Third party (service delivery) companies* such as data and call centres can also benefit when focusing their effort on this growing market.

Home care organisations can gain time in their daily round through better communication with patients and data/activity monitoring which could lead to improved patient treatments, less work pressure or increased number of patients to be served (e.g. by making use of video communication). An OCMW, which is the local public care provider, offers multiple services to elderly persons such as local service centers, assistant daily life services (meals on wheels, handymen cleaners), residential care settings (hospitals, homes for the elderly), social housing, etc. The introduction of eCare systems in their social houses or at the patient's premises can improve the care provisioning (e.g. personal alarm system, video communication) and is an opportunity to keep people longer at home by offering transmural services. Both organisations could also benefit from their current distribution channels for offering this product to their patients. *Primary care providers* such as general practitioners, when introducing telemetry monitoring and video conferencing service, would be able to more efficiently use their time by replacing a number of physical consultations with eConsultations, and potentially attracting new patients.

Public or private *insurance companies* will also benefit by offering innovative services to their customers leading to a better assessment of the patient and potentially a lower tariff. *Public bodies*, controlled by the government, must take care of a financial system for subsidizing and reimbursing eCare solutions, certainly during the start-up of this new market. The amount of subsidies can be large, but socio-economic benefits and control of the overall (growth of the) health care budget needs to be considered.

Finally the *patients* will benefit from a better service delivery, health monitoring and communication with all involved care providers. The main issues concerning the migration towards eCare services for patients relate to the trade-off between their own financial contributions versus improved/additional health care they receive: what services will the patient accept (e.g. telemetry, communication, emergency button, etc.) and which actions will the patient perform; will the patient trust the system (security, misconduct by other parties); what is the willingness to pay for these offered services; will this all leads to an improved health care system?

Within [5] a quantitative analysis has been performed, indicating the potential for all actors involved. Below some benefits are stated:

- For home care organizations, the total amount of time savings per patient per year (less consultations and savings in time per visit) is estimated at 198 and 122 minutes, respectively. This time saved could be used to take care of new patients, or to lower work pressure in this sector.
- A decline of unserved elderly population of about 30% can be reached, compared to the situation of no intervention, when transmural services are offered to keep elderly people longer at home.
- We estimated a 20% decrease of consultations from patients older than 65 for the GP which leads to a decrease in revenues (29% for in practice consultations, 71% for home consultations) but the time gained could be used for eConsultations and additional consultations as new source of revenues.

2.3 Business Scenarios

Different business scenarios have been investigated and worked out, depending on the leading actor (taking up most of the roles and/or be the driver for selling and distributing the eCare service). We have defined 5 scenarios:

- *Third parties*: several solutions can be bought separately on the market, which can be compatible with the services offered by the care organizations
- *Telecom operators*: making use of their own platform and customers' base
- *Public/private insurance companies*: as extension of their current service offering
- *Government*: to offer a communal platform for all care actors involved
- *Home care organizations*: as extension of their current service offering

These scenarios were evaluated in a workshop with people from different backgrounds (industry, care actors, governmental instances and third payers) in terms of which scenario would be best to stimulate and speed up ICT supported care service introductions into the Flemish market. The public/private insurance, government and home care models were selected above the third parties and telecom scenario and based on quantitative evaluation, showed as most reliable and sustainable in the long run [6]. As our health system is well built out with health care subsidized by the government and obliged subscriptions with public insurance companies, this ensures that most of these insurance companies are non-profit organizations, resulting in low profit margins. Home care organizations depend on (public) insurance companies and strive for (low) profit in the end. Private actors will strive for a higher profit margin, leading thus to a more expensive solution for the end customer.

3 Xtramira Platform

The introduction of the Xtramira will be explained in this section, indicating the concept development, business model, product development and market introduction. Based on this analysis we will draw some lessons learned in Section 4.

3.1 Concept Development Phase

The project started of with a concept-testing phase based on an assembled system and a few users to validate the feasibility of the concept and the acceptance by the users (i.e. the elderly as well as the professional care). During this testing phase no specific cost was charged to the end user. After this test phase a central desk service was defined which could take up a role in care coordination based on video communication. Based on the results, it was further decided that the family-video communication would remain in the commercial introduction while the telemetry would be postponed. The validation with stakeholders and financial analysis indicated that an additional service "personal alarm" had to be added in order to create a sustainable model.

3.2 Business Model

The first business model for the product and services took only the care supporting features into account. This meant that the user had the perception to pay for an optimization at the side of the care organization: instead of having a nurse coming at home, the end user had to use the system instead. As the features are unknown in a new to introduce service, it is hard to motivate all parties to invest in the system. Together with some leading care organizations a search was performed to investigate if it was possible to link the new service with an already well know (and publically cofounded) existing service. This search resulted in the addition of the personal alarm service (PAS) functionality to the Xtramira system. This was a crucial factor for the introduction of the product. PAS systems have been rolled out in Flanders by the different (non-profit) insurance companies. The functionalities include a system with an emergency button for direct contact with neighbors, family or call center when required and in more advanced versions also fall detection, CO or fire detectors, GPS location or GSM alarm is included.

Most importantly for this business case a regulated funding scheme was created by the Flemish Government for the purchase and repayment of PAS systems by social service centres [7]. Several rules must be taken into account before a subsidy can be granted.

- 50% of all PAS system must have at least 2 functionalities as described above ([7] Art. 1)
- Subsidies are limited based on the number of PAS systems per social service center: maximum 30 and 60 in total, with maximum of 10 and 15 per year, for local and regional service centers, respectively ([7] Art. 2). The maximum amount of devices could be purchased in one batch and subsidized when highly motivated.
- PAS systems can be replaced, and thus re-subsidized, every four years.
- For the year 2007, a maximum of 7.560 PAS devices could be subsidized.

3.3 Product Development Phase

As the concept development was done using an assembled system, in order to advance user acceptance testing in the overall development cycle, the product development was initiated in a later phase. Based on the user evaluations and the business model elements (such as PAS) a product oriented development cycle was initiated. Starting from the assembled elements a new design had to be created to fulfill the functional requirements at a device and manufacturing cost conform the conclusions of the business model. This process encompassed the search for electronic components and embedded platforms as well as the development of new software components for the product. During this phase additional usability tests were performed to insure the easy-to-use factor for the end user. The usability cycle was done twice: a first time using paper mock-ups, a second time using an operational system.

Additionally the product development phase also focused on more operational elements that are needed for industrialized products such as remote updating and management, centralized configurations, device replacement scenarios, etc. It should be obvious that, although highly relevant for actual products, these elements were disregarded for the concept development phase based on the assembled system.

3.4 Market Introduction

Based on these conclusions, a commercial Xtramira device was built. “This product improves, in a unique way, the self-help possibilities and dignity of the resident via a wide range of visual and auditory communication means. This comfort in combination with the

increasing safety of the personal alarm makes Xtramira a revolutionary system in healthcare [4]". As the Xtramira product could be launched under the umbrella of the PAS subsidy rules, this could lead to an extra boost for social service centers to purchase this product. Compared to competitive systems, as indicated in the introduction, the Xtramira has additional value added features and services.

The procedure was started up, under support of the public care provider of the city of Kortrijk (OCMW), to enable the Xtramira to be eligible for government funding according to the PAS regulation which was successful in the end.

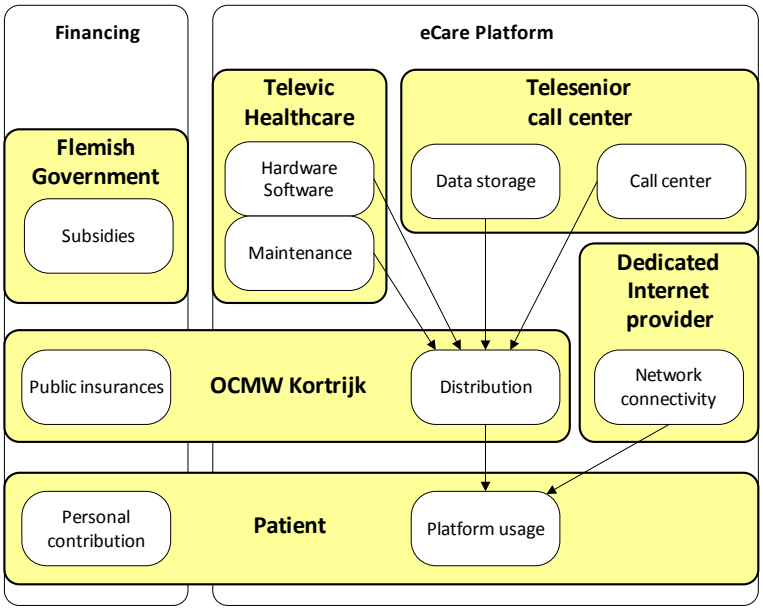

Figure 1: Business Model for the Telesenior Service

The OCMW Kortrijk organization purchased 150 devices in order to start up the commercialization of the "Telesenior service" [8][9] in a pilot phase and used its contacts to make the service known to the target population. The business model for introducing the Xtramira platform within the Telesenior project can be seen in Figure 1. After one year, the actual uptake of the system proved very low and the model was further widened beyond pure consumer home care towards service flats (closely related to home care but collectively managed). While this approach proved successful in the beginning, the model did not scale up and today most of the 150 devices purchased are still unused. This can partly be explained by the following facts:

- The marketing focuses mainly on the alarming aspects (hence entering in direct competition of cheaper PAS solutions and no perception of the additional value)
- The telecom environment remained closed (allowing only communication between subscribers of a specific operator)

Elderly people would not pay an extra fee for an Internet connection, and the strict localization (city of Kortrijk) of all services.

4 Lessons Learned and Next Steps

The launch of the Xtramira did not make up to the expectations of the market. Several reasons can be listed.

- *Launching a new product in a new market in the old fashioned way*: The product was innovative compared to the current PAS solutions, with additional functionality. However this was not perceived by the customers of the product.

- *The wrong business model*: Using the PAS business model as basis for the product launch has its benefits (such as the regulated subsidization of the systems) but also its limitations. The product was seen as another PAS system, which was not the main focus of the product development. Customers did not see the additional value of the services offered with the Xtramira. Too much focus on PAS also brings the connotation with a clear "need" for care and the label of "not being able to live alone", which is not attractive from marketing perspective.
- *Low Internet technology acceptance*: Elderly people did not see the use of Internet functionality (related to the lack of acceptance for additional services), certainly related to the high cost of basic Internet services in Belgium.
- *Different perspectives*: The elderly perceive known services as commodity and do not take them into account when seeing to full cost/benefit picture e.g. they all know analogue telephony as a commodity and thus do not take into account the connection cost when calculating the overall cost for a classic PAS system, but the additional fee for an Internet connection is perceived as very costly and unnecessary. This will change over the next decade as Internet will also become a commodity within that niche of the market.

Taking into account these lessons learned, new research has been launched in order to study additional services and gain evidence based insights in the users. A more elaborate pilot has been defined and is currently starting up, based on extended initial services and a second telecom operator. It is assumed that this will enable a better identification of the thresholds and will allow tuning the services towards a more attractive package while creating an offering that is no longer constrained to one single telecom operator. This pilot will be tested in the Fiber to the Home (FTTH) living lab LeyLab [10], in Kortrijk, Belgium. Stated in [11], FTTH network and unlimited bandwidth capacity will be one of the main drivers of introducing new eCare applications to the people at their own premise. This living lab will allow to define, test and evaluate additional scenarios with more immediate value, and take the product to other market segments such as collective living formats where the cost of an Internet connection can be shared amongst multiple households.

5 Conclusions

The introduction of smart ICT and Future Internet services, such as video telephony, tele-medicine, and personal alarm systems can contribute to a more sustainable and qualitative life for elderly people living at home. This involves a lot of actors in a complex eco-system, all with their own expectations and outlook for potential benefit, either in business or social benefit. The Xtramira project was presented, introducing family video communication and personal alarm systems. We indicated that the introduction did not run very smoothly due to factors that could not be foreseen from the beginning. The main reason was that too much bottlenecks needed to be tackled from the beginning. The ICT factor, in this case the video telephony, was for instance not ready to be introduced by elderly with no experience with Internet services. Once this factor can be solved, for instance in the new LeyLab living lab environment where every house is connected with fiber, this uptake might be faster than the current case.

Finally concluding, all actors participating in the offering of the eCare platform and services can benefit from the implementation of the system, which is of great importance to help formulating a business model towards governmental agencies, insurance companies, health care providers or private investors as to how much and how soon to invest in eCare, but all their expectations and outlook for potential benefit, either in business or social benefit, and potential bottlenecks should be considered. Most important to remember is that the introduction of a new innovative product or service in a new market (segment) requires

a new business model. Focusing on the current value network decreases your success rate, will limit the opportunities and small or unforeseen barriers and bottlenecks can and will be decisive in limiting your market potential or ultimately discontinuation of the product support.

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